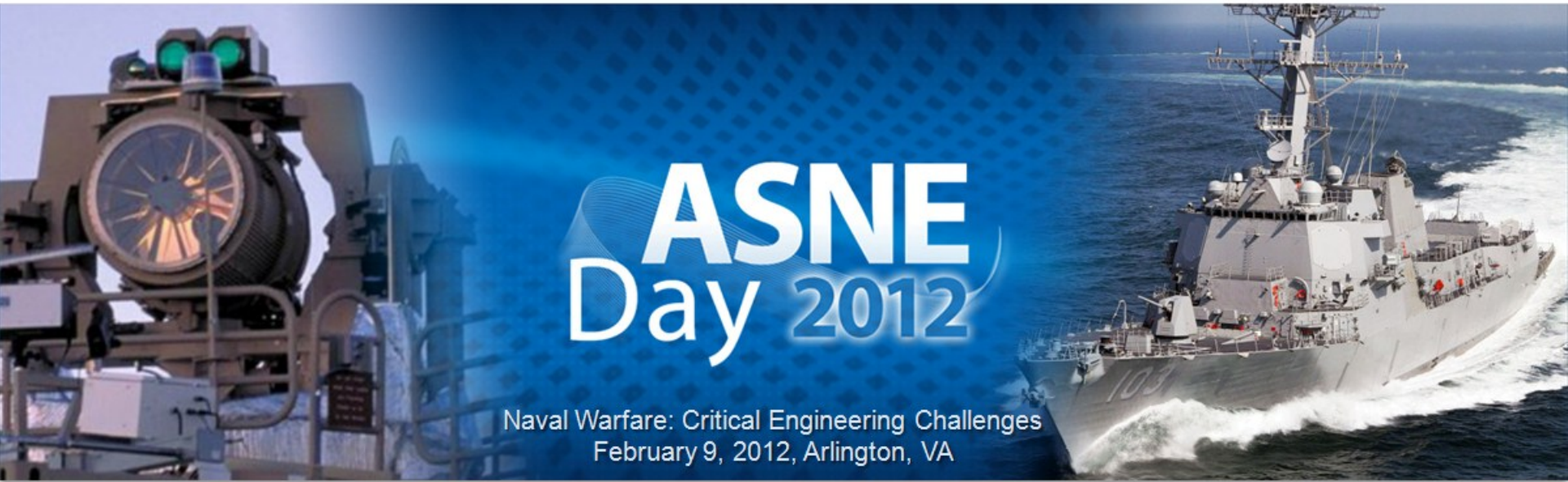


Hull, Mechanical, & Electrical (HM&E) Roadmap: Revolutionizing Naval Warfare and Achieving Energy Security



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Honorable Ray Mabus 75th United States Secretary of the Navy

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“OUR SHIPS – THE SYSTEMS THAT WE USE AND THE POWER REQUIREMENTS THAT THEY HAVE ARE GETTING BIGGER ALL THE TIME. EVERY SYSTEM WE’RE PUTTING ON A SHIP NOW OR IN AN AIRCRAFT IS IN SOME WAYS SORT OF A POWER HOG... WE HAVE TO FIND A DIFFERENT WAY TO POWER THE THINGS WE NEED TO POWER.”

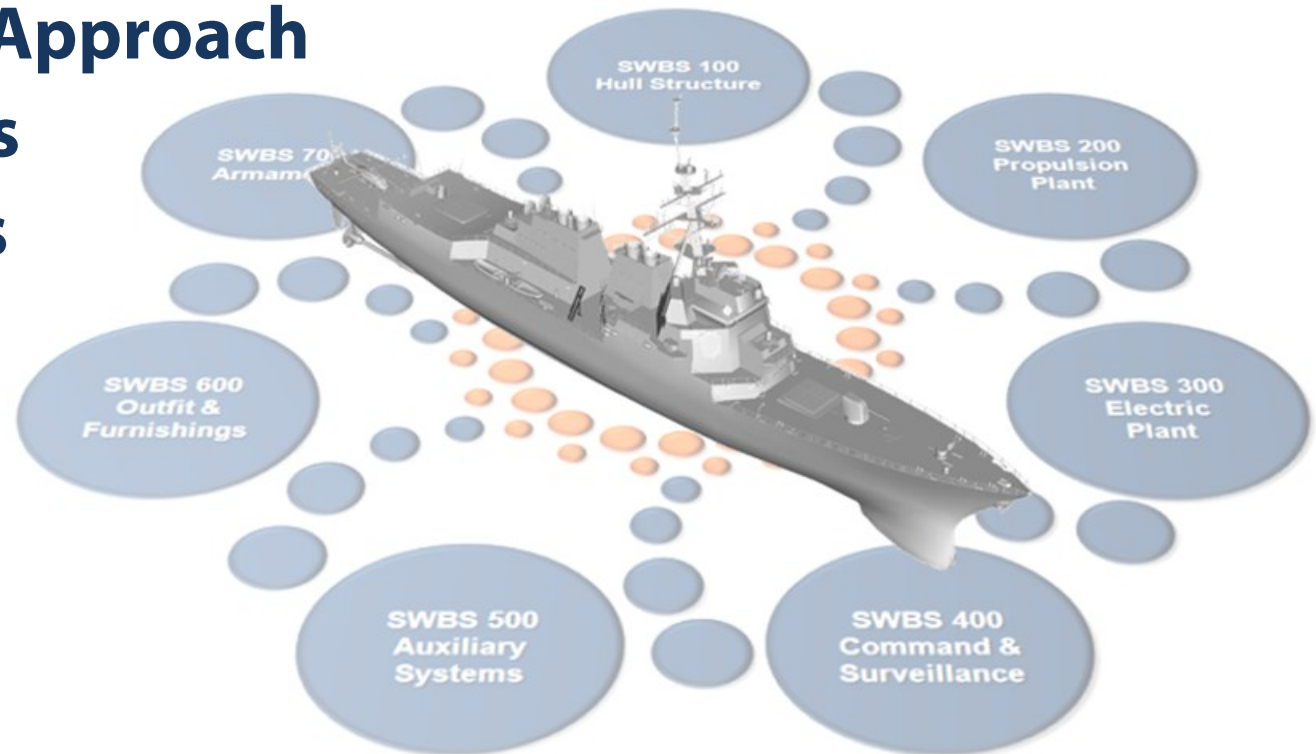
ARPA-E
ENERGY  INNOVATION
SUMMIT

Fundamental Shift Required for In-Service and New Construction Programs

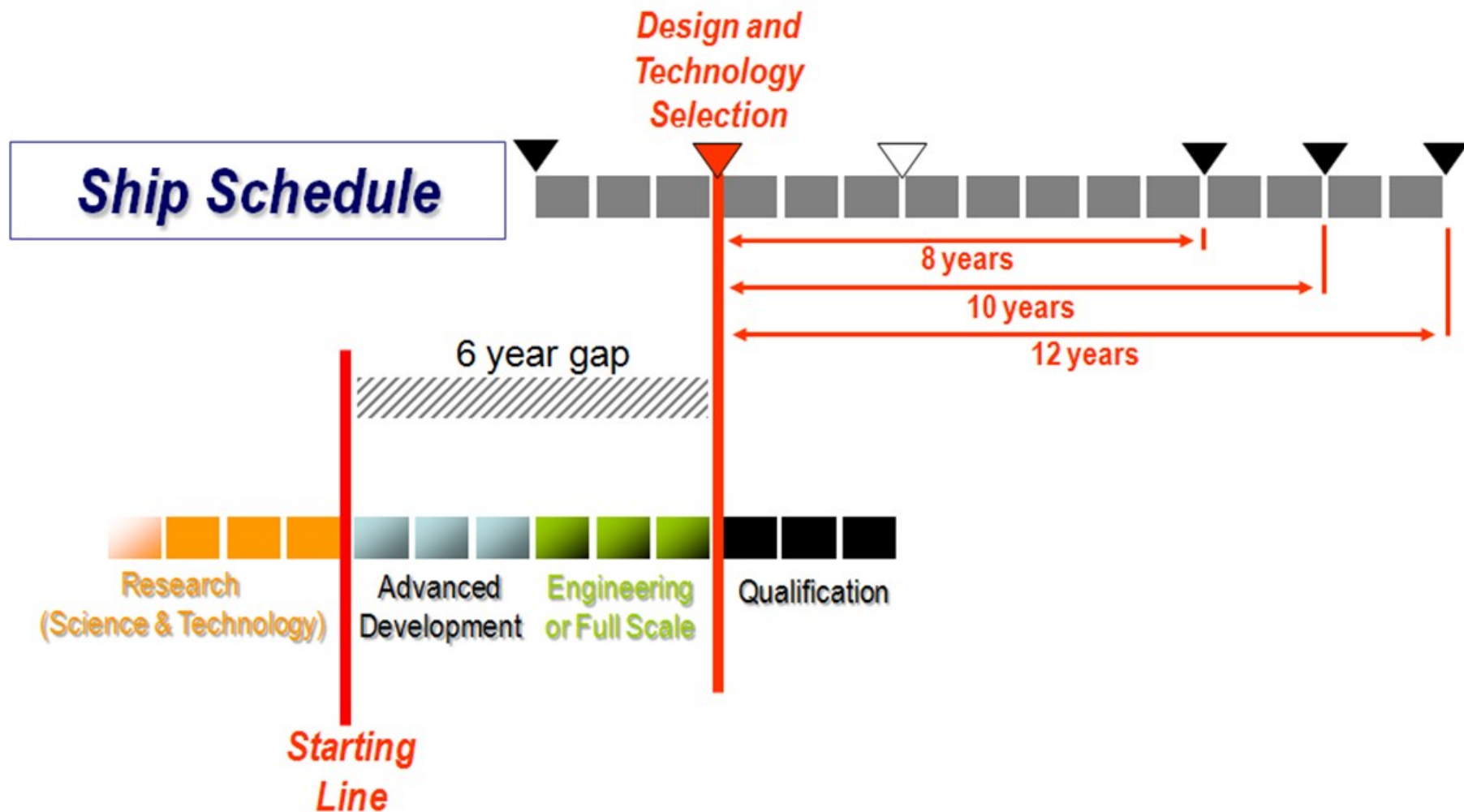
HM&E Roadmap: Revolutionizing Naval Warfare and Achieving Energy Security

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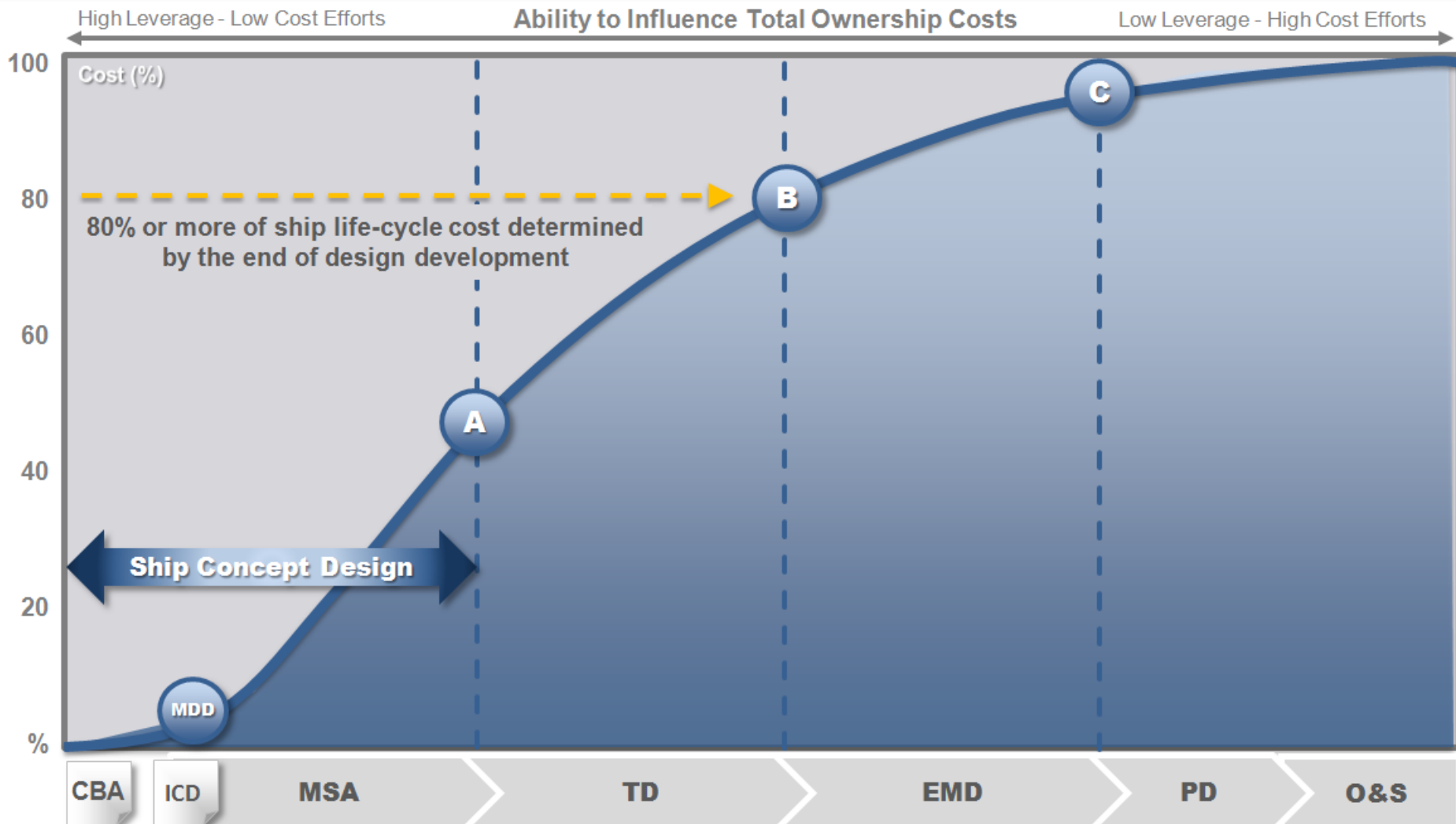
- Background
- Objective
- Purpose of Roadmap
- Proposed Approach
- Challenges
- Next Steps



Background: Notional Timeline



Background: Ability to Influence Total Ownership Costs



Greatest ability to influence with lowest cost impact is during pre-Concept Design

Develop a technology plan that is responsive to future threats & weapons capabilities, shipbuilding plans & schedules, current fleet opportunities, and budgetary realities

Provides sufficient data to inform budget decisions for S&T, R&D, new acquisition/construction, and fleet insertion

Provides a means of expressing HM&E needs and opportunities to resource sponsors, S&T/R&D organizations, ship/warfare systems program managers, and fleet activities

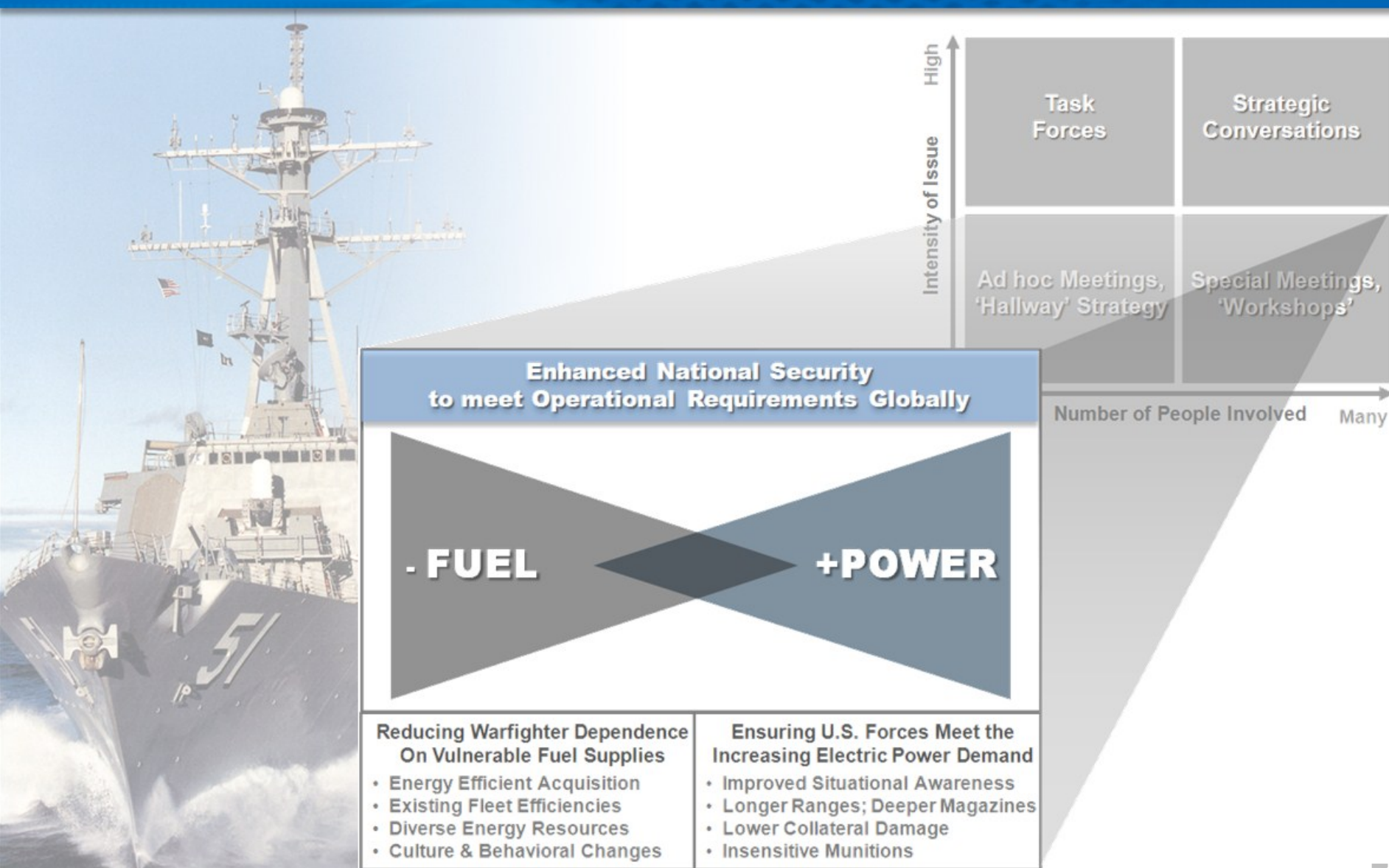
Resolves competing frameworks (future warfare requirements, life cycle costs, etc.) that foster short-term stovepipe approaches rather than long-term sustainable solutions

Serves as unifying document between organizations to address future challenges in full alignment

Provides a foundation for Industry and Government agencies to focus their resources

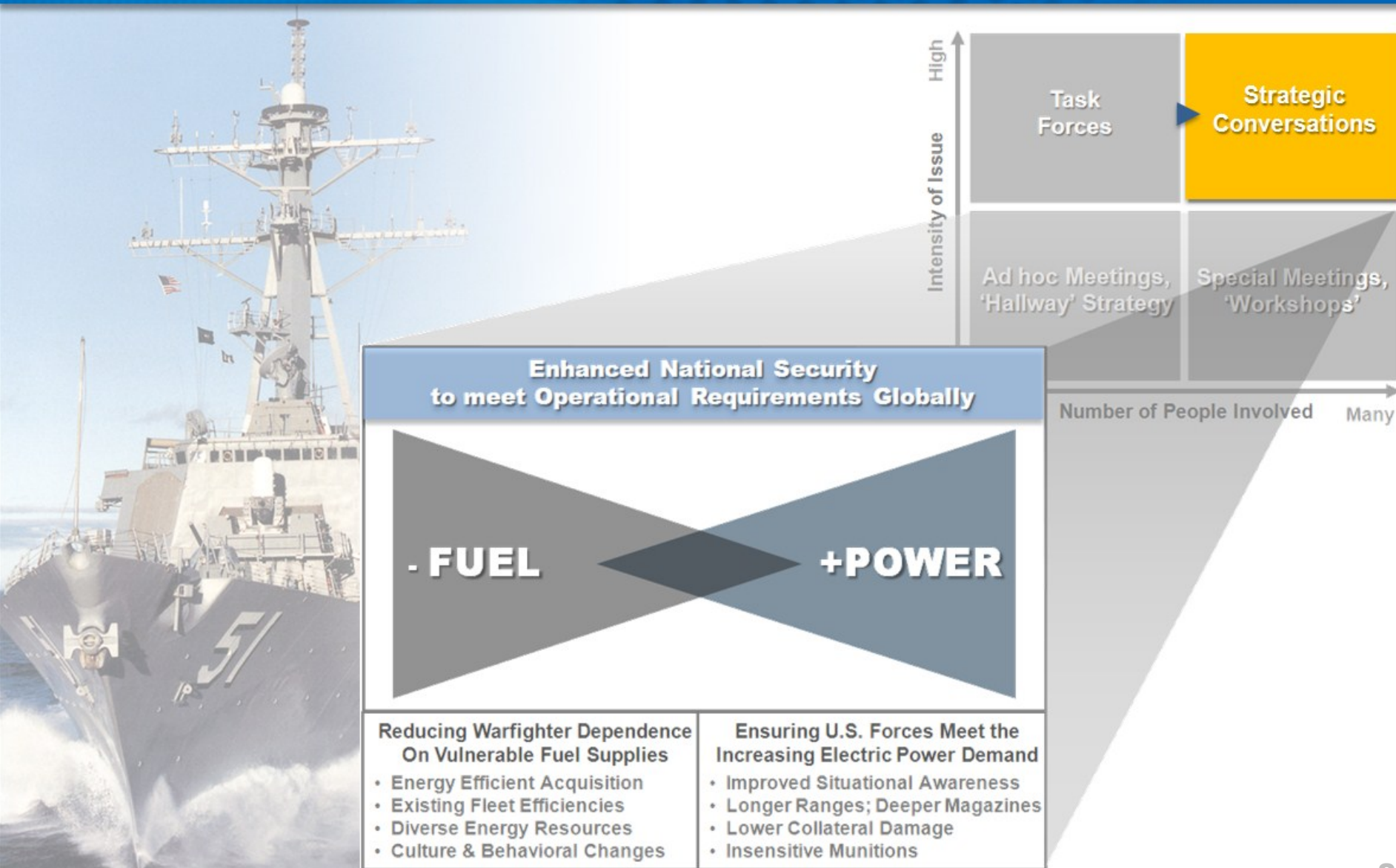
Purpose: Energy As A Strategic Resource

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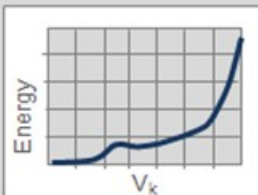
Approach: Identifying the Gap

Total Life-Cycle Energy Requirement

Overarching Design Reference Mission

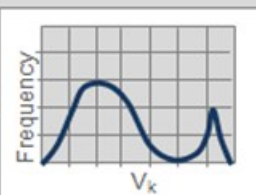
Propulsion Energy

(Ship Type Energy vs. Speed)



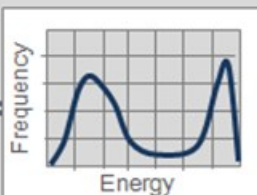
Operational Profile

(Ship Type V_k vs. Frequency at Mission)



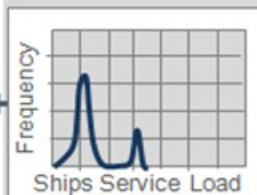
Propulsion Energy

(Ship Type Energy vs. Frequency at Mission)



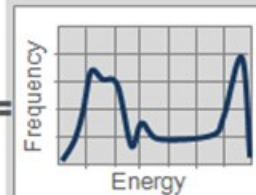
Ship Service Energy Load

(Ship Type Energy vs. Frequency at Mission)



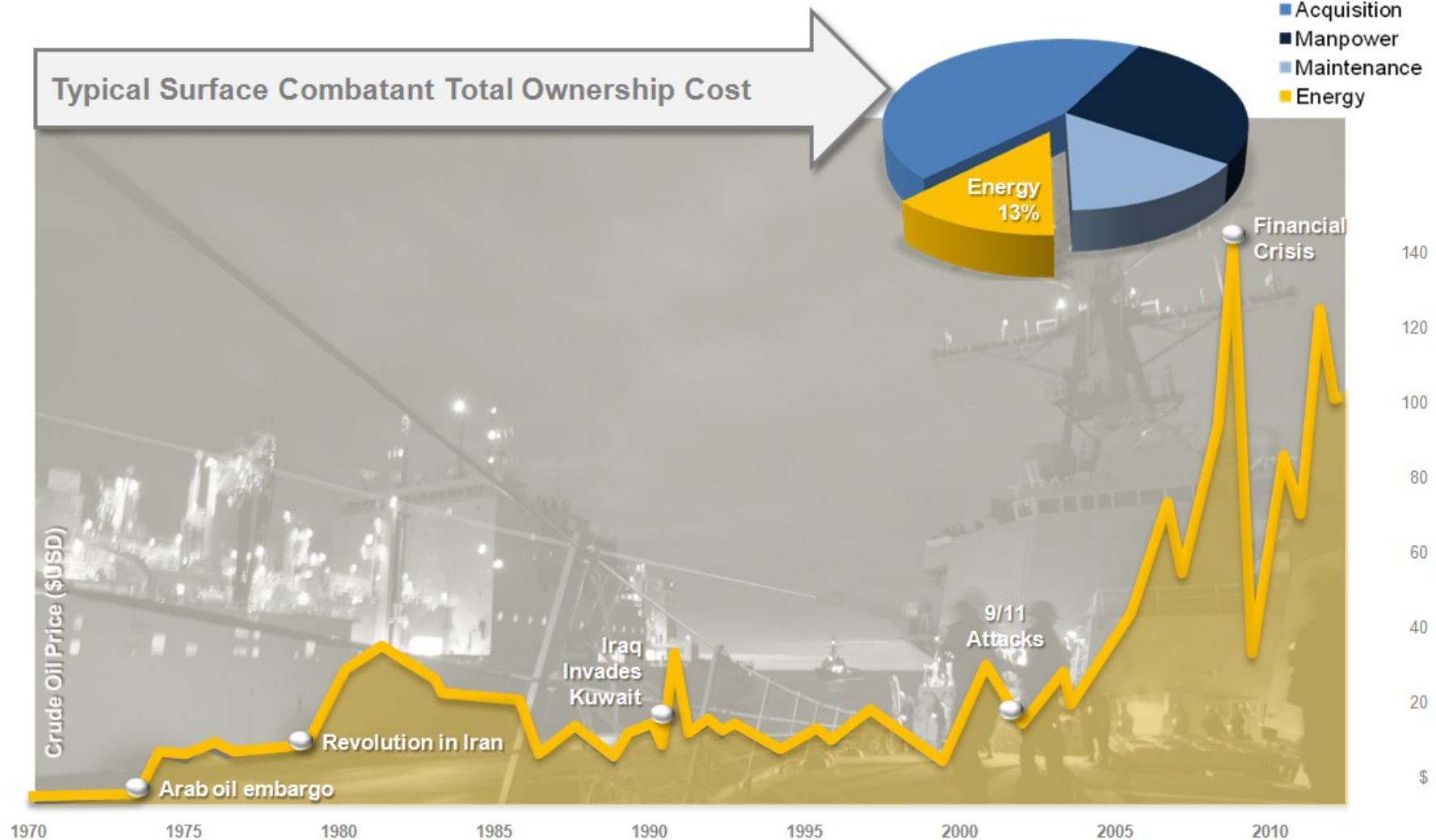
Ship Total Energy Load

(Ship Type Total Energy vs. Frequency at Mission)

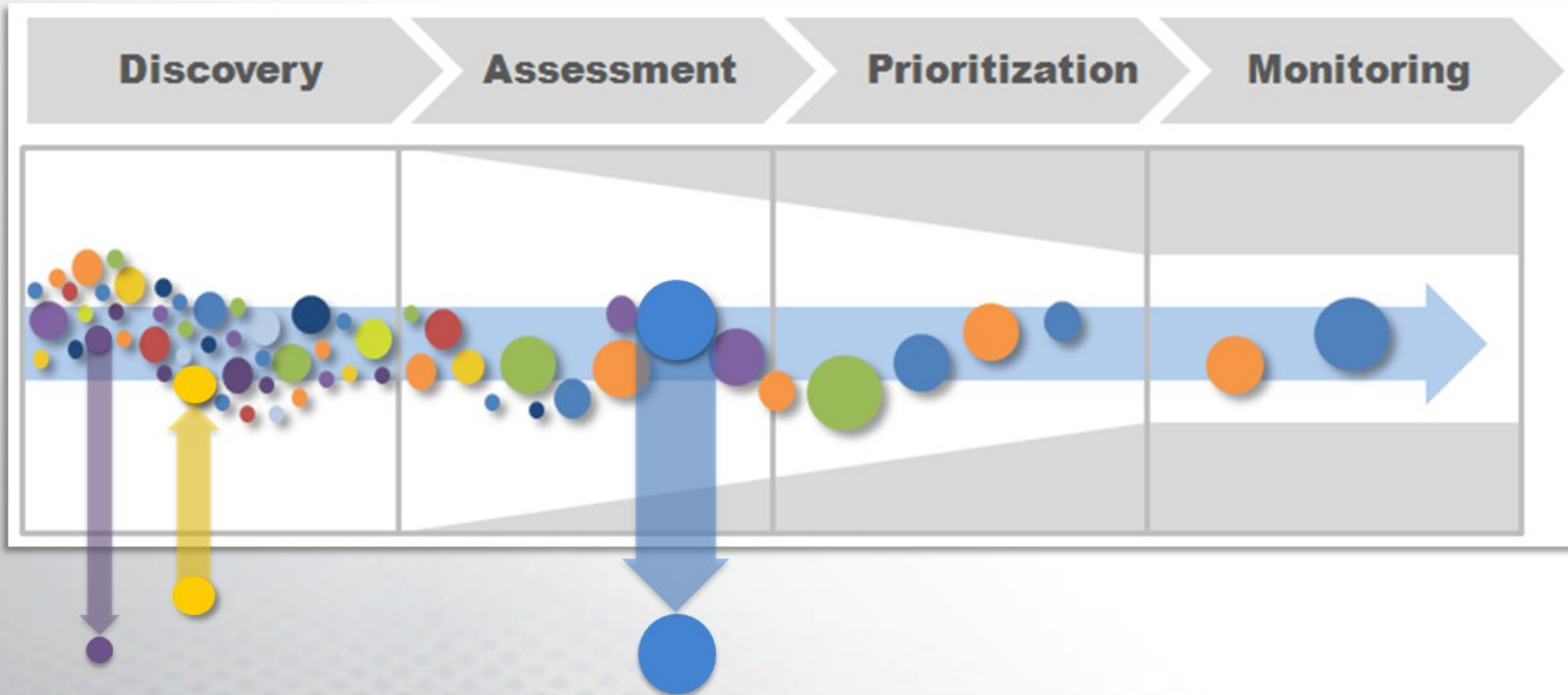


Mission Profile, Operational Tempo, & Expected Service Life

Approach: Identifying the Gap



Approach: Balanced Technology Portfolio

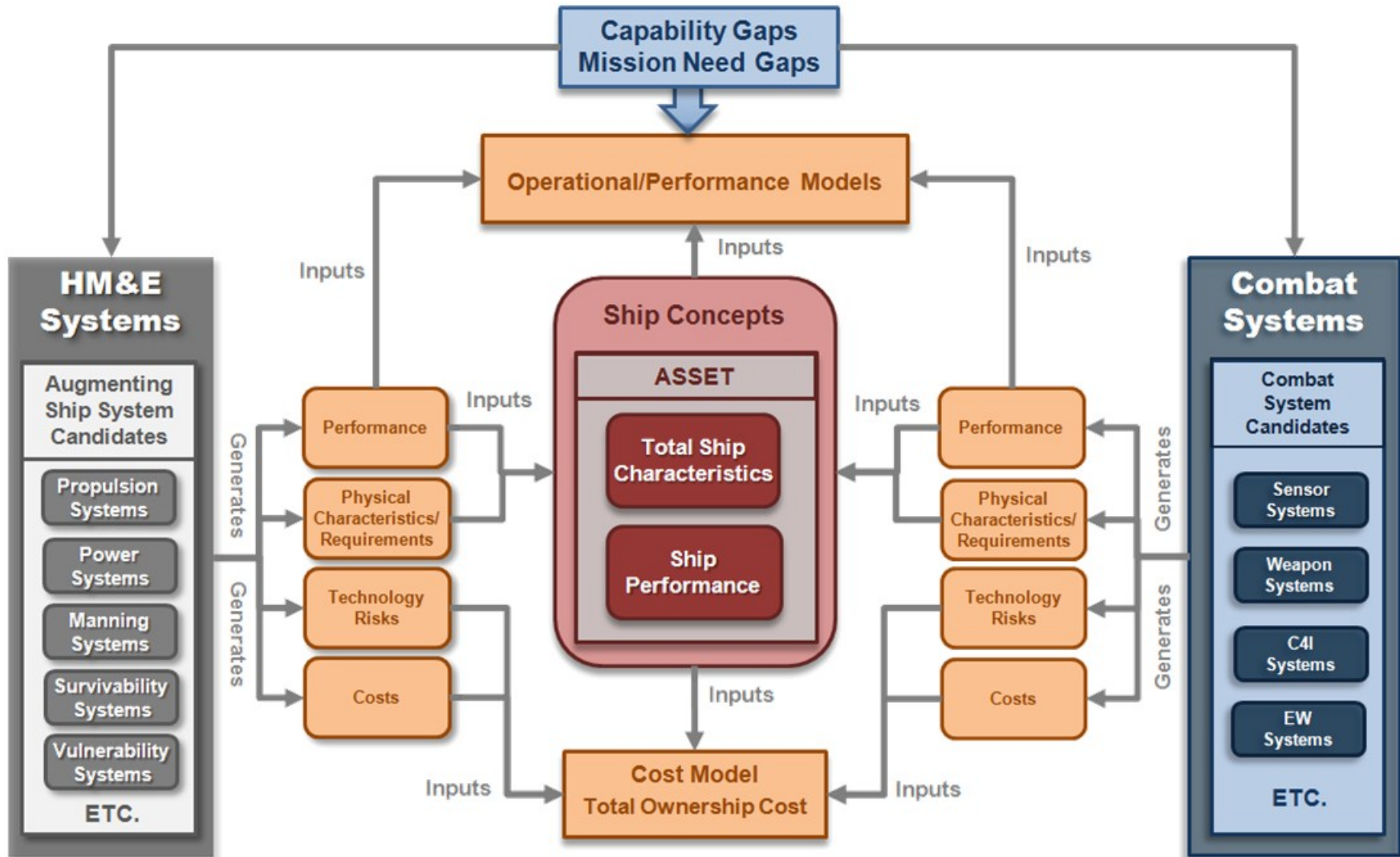


Maritime Energy Portfolio Process

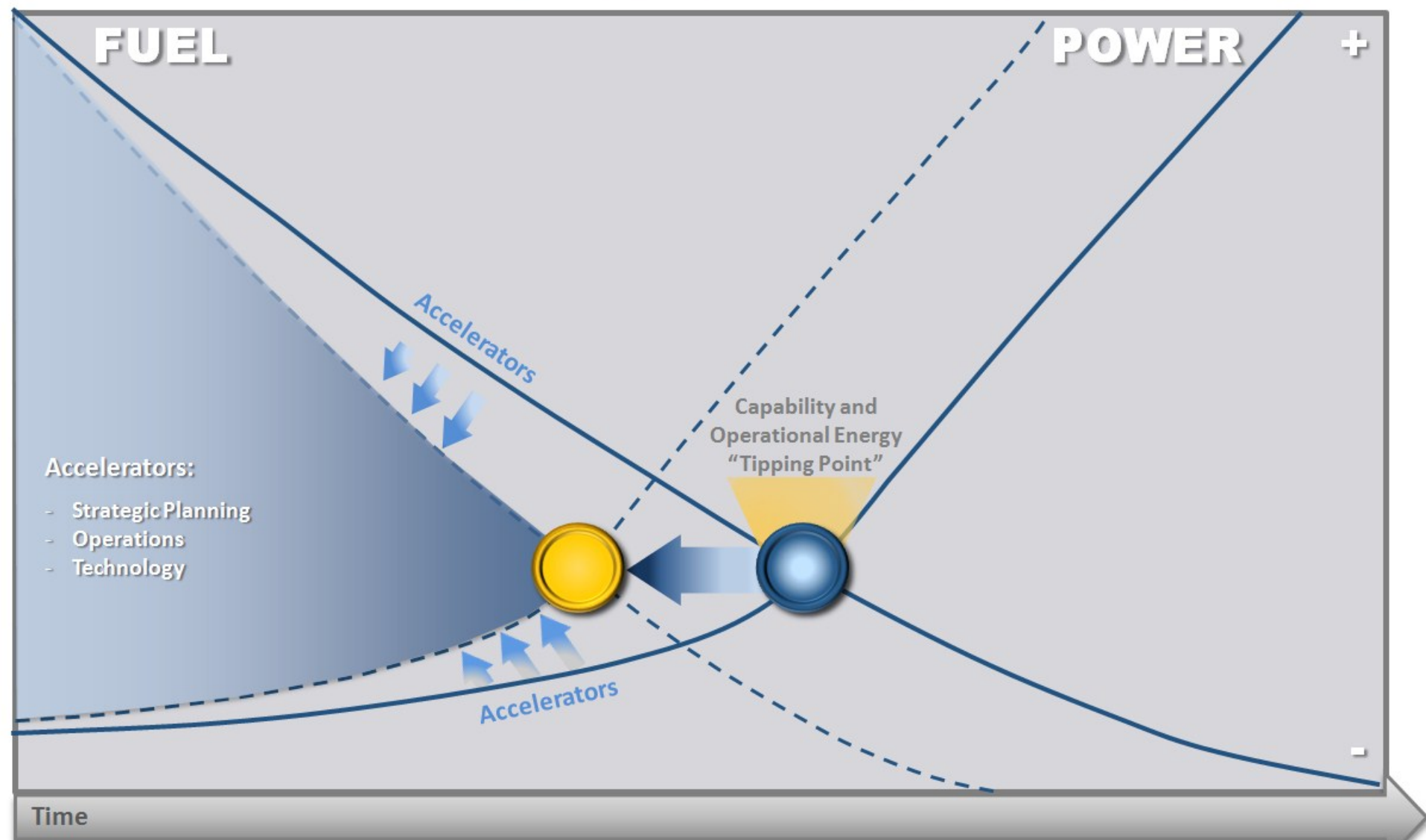
Define a portfolio of concept alternatives that fulfill current and future mission and capability gaps, meet the needs, requirements, and acquisition cost goals

Establish traceable linkages and direct relationships between mission effectiveness/performance associated with individual ship concepts, technology risks, acquisition cost, and total ownership cost

HM&E Roadmap Approach: Capability Based Concept Development

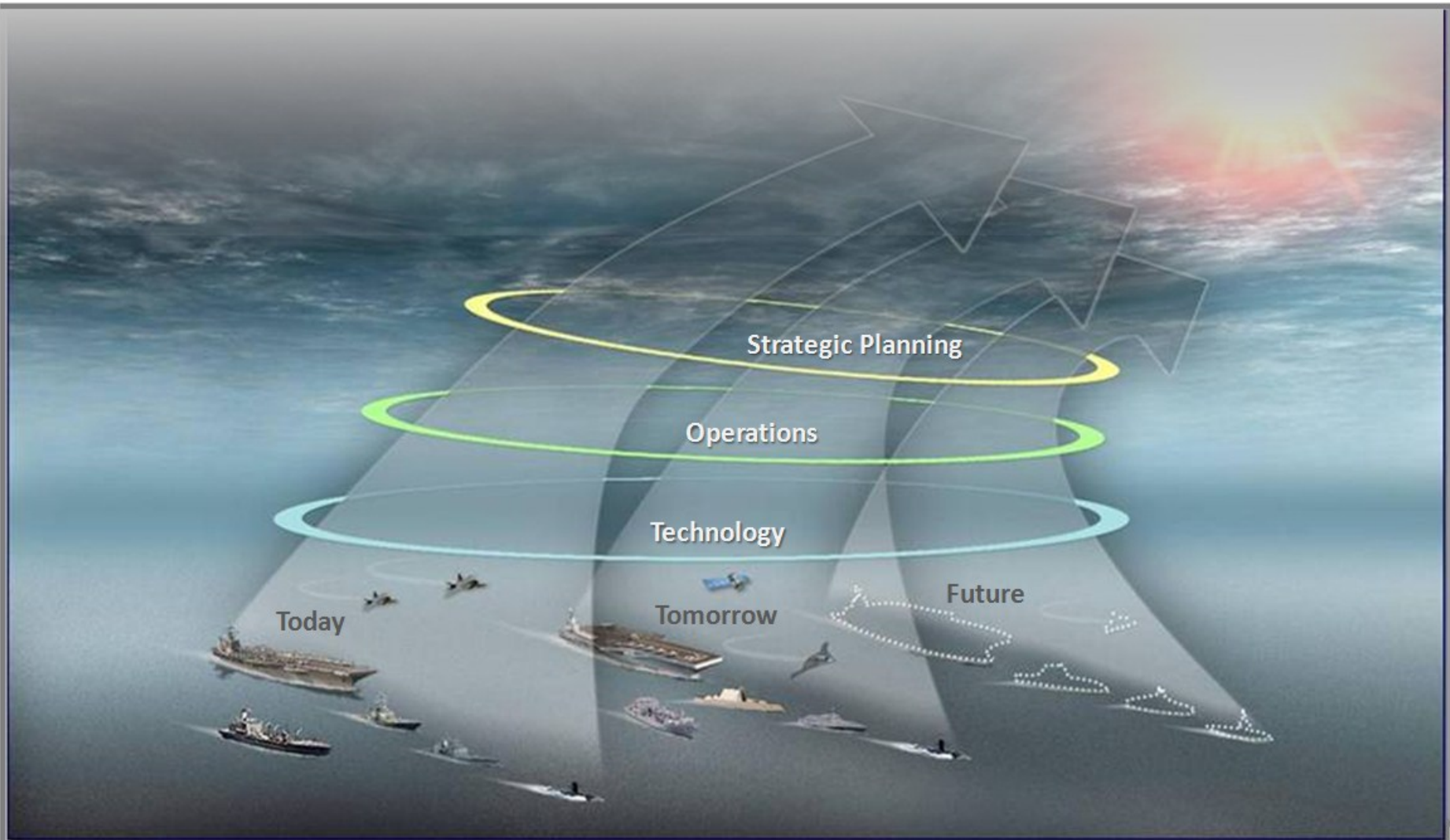


Approach: Accelerating the Transformation



Approach: Moving Toward an Energy Secure Fleet

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Time

HM&E Roadmap... what it means

- Communicating the Vision from top to bottom
- Integrating S&T focus with shipbuilding plans
- Identifying gaps and focus areas
- Identifying areas of synergy for common investment
- Linkages to program needs and milestones
- Leverage enterprise-wide partnerships
- Sharing knowledge across teams

